

In the Claims:

Please amend claims 1-3, 7, 9 -11. Please cancel claims 4 and 5. Claims 12-28 are withdrawn. Please add new claims 39-54. The claims are as follows:

1. (Currently Amended) An apparatus, comprising:

a product carrier adapted to transport product undergoing manufacture; and

a first device adapted to sense an attribute of an environment within said product carrier
~~or an event affecting said product carrier; and~~

a second device adapted to encode data relating to said attribute and to actively and wirelessly transmit said data.

2. (Currently Amended) The apparatus of claim 1, ~~further comprising:~~ wherein ~~wherein~~ [[a]] said second device adapted to receive said attribute or event data sensed by said first device and to transmit said attribute or event data includes a radio transmitter.

3. (Currently Amended 1) The apparatus of claim ~~[[2]]~~ 1, wherein said first device and said second device are ~~the same device~~ integral with each other.

4 - 5 (Canceled)

6. (Original) The apparatus of claim 1, wherein said product carrier is adapted to be sealed against the surrounding atmosphere of a manufacturing facility that said product is being manufactured in.

7. (Currently Amended) The apparatus of claim [[2]] 1, wherein said second device is programmable with at least a unique product carrier identity and is adapted to transmit said product carrier identity with said data relating to said attribute or event.

8. (Currently Amended) The apparatus of claim 1, further including additional devices, each additional device adapted to sense one or more additional attributes of the environment within said product carrier ~~or an event affecting said product carrier~~.

9. (Currently Amended) The apparatus of claim 8, ~~further comprising:~~ wherein said [[a]] second device is adapted to receive encode data relating to said attributes or events sensed by said first device and by said additional devices and actively and wirelessly transmit said data related to said additional attributes or events.

10. (Currently Amended) The apparatus of claim 1, wherein said attribute of said environment within said product carrier ~~or an event affecting the product carrier~~ is selected from the group of attributes and events consisting of temperature, pressure, humidity, particulate count[[,]] and the presence of oxygen, hydrogen, chlorine, elemental gases, ammonia, water vapor, hydrogen fluoride, hydrogen chloride, nitrogen oxides, silanes, alcohols, ketones, esters, amines, solvents, chlorinated solvents and fluoridated solvents a gas or vapor within said product carrier, the occurrence of vibration, acceleration and shock, the intrusion of visible light, ultra-violet light, infrared light and microwaves, and electromagnetic events and static electric charge buildup.

11. (Currently Amended) The apparatus of claim 1, wherein [[a]] said product within said product carrier is selected from the group of ~~products~~ consisting of a semiconductor substrate~~[[s~~ and]] a wafer~~[[s]]~~, a photolithography mask~~[[s]]~~, a photolithography reticule~~[[s]]~~, a semiconductor module~~[[s]]~~, a semiconductor package~~[[s]]~~, a circuit board~~[[s]]~~, a magnetic disk~~[[s]]~~, a magnetic hard drive disk~~[[s]]~~, a magnetic floppy disk~~[[s]]~~, a laser disk~~[[s]]~~, a compact disk~~[[s]]~~, a digital video disk~~[[s]]~~, an optical disk~~[[s]]~~, a lens~~[[es]]~~ and a mirror~~[[s]]~~.

12. (Withdrawn) A method of monitoring an internal environment of a product carrier or events affecting said product carrier in a manufacturing facility, comprising:

providing said product carrier, said product carrier transporting product undergoing manufacture; and

providing a first device sensing an attribute of the internal environment of said product carrier or an event affecting said product carrier.

13. (Withdrawn) The method of claim 12, further comprising:

providing a second device, said second device receiving said attribute or event data sensed by said first device; and

transmitting said attribute or event data.

14. (Withdrawn) The method of claim 13, further including transmitting said attribute or event data to a location external to said product carrier.

15. (Withdrawn) The apparatus of claim 13, wherein said first device is contained within said product carrier or said first device and said second device are contained within said product carrier.

16. (Withdrawn) The method of claim 13, wherein said first device and said second device are the same device.

17. (Withdrawn) The method of claim 12, further including sealing said product carrier from the surrounding atmosphere of said manufacturing facility.

18. (Withdrawn) The method of claim 13, further including:

programming said second device with at least a unique product carrier identity; and
transmitting said product carrier identity with said attribute or event data.

19. (Withdrawn) The method of claim 12, further including providing additional devices, each additional device sensing one or more additional attributes of the environment within said product carrier or an event affecting said product carrier.

20. (Withdrawn) The method of claim 19, further comprising:

providing a second device;
said second device receiving said attribute or event data sensed by said first device and
by said additional devices; and
said second device transmitting said attribute or event data.

21. (Withdrawn) The method of claim 12, wherein said attribute of said environment within said product carrier or an event affecting the product carrier is selected from the group of attributes and events consisting of temperature, pressure, humidity, particulate count, the presence of oxygen, hydrogen, chlorine, elemental gases, ammonia, water vapor, hydrogen fluoride, hydrogen chloride, nitrogen oxides, silanes, alcohols, ketones, esters, amines, solvents, chlorinated solvents and fluoridated solvents, the occurrence of vibration, acceleration and shock, the intrusion of visible light, ultra-violet light, infrared light and microwaves, and electromagnetic events and static electric charge buildup.

22. (Withdrawn) The method of claim 12, wherein a product within said product carrier is selected from the group of products consisting of semiconductor substrates, 100 mm semiconductor substrates, 200 mm semiconductor substrates, 300 mm semiconductor substrates, 450 mm semiconductor substrates, wafers, 100 mm diameter wafers, 150 mm diameter wafers, wafers 200 mm diameter wafers, 300 mm diameter wafers, 450 mm diameter wafers, photolithography masks, photolithography reticules, semiconductor modules, semiconductor packages, circuit boards, magnetic disks, magnetic hard drive disks, magnetic floppy disks, laser disks, compact disks, digital video disks, optical disks, lenses and mirrors.

23. (Withdrawn) A manufacturing system comprising:

a multiplicity of manufacturing tools;

a multiplicity product carriers having micro-sensors, each product carrier adapted to transport product undergoing manufacture between said manufacturing tools and each micro-

sensor adapted to sense at least one attribute of an environment within each product carrier or an event affecting each product carrier and adapted to transmit date and time stamped product carrier identity and attribute and event data; and

one or more receiving stations, each receiving station adapted to receive said product carrier identity and attribute and event data from said micro-sensor.

24. (Withdrawn) The system of claim 23, further including a production control system adapted to track the manufacturing tool location of said product carriers and to generate date and time stamped product carrier location data.

25. (Withdrawn) The system of claim 24, further including a product carrier monitoring system adapted to collect said date and time stamped product carrier identity and attribute and event data, cross-reference said date and time stamped product carrier location data with said date and time stamped product carrier identity and attribute and event data and generate date and time stamped product carrier identity, attribute and event, and product carrier location data.

26. (Withdrawn) The system of claim 25, wherein said product carrier monitoring system is adapted to generate flags based on said attribute and event data.

27. (Withdrawn) The system of claim 26, further including a statistical process control system adapted to generate an analysis of said attribute and event data.

28. (Withdrawn) The system of claim 27, wherein said statistical process control system is further adapted to transfer said analysis of said attribute and event data to said production control system.

29. (Withdrawn) The system of claim 23, wherein said attribute of said environment within said product carrier or an event affecting the product carrier is selected from the group of attributes and events consisting of temperature, pressure, humidity, particulate count, the presence of oxygen, hydrogen, chlorine, elemental gases, ammonia, water vapor, hydrogen fluoride, hydrogen chloride, nitrogen oxides, silanes, alcohols, ketones, esters, amines, solvents, chlorinated solvents and fluoridated solvents, the occurrence of vibration, acceleration and shock, the intrusion of visible light, ultra-violet light, infrared light and microwaves, and electromagnetic events and static electric charge buildup.

30. (Withdrawn) The system of claim 23, wherein a product within said product carrier is selected from the group of products consisting of semiconductor substrates, 100 mm semiconductor substrates, 200 mm semiconductor substrates, 300 mm semiconductor substrates, 450 mm semiconductor substrates, wafers, 100 mm diameter wafers, 150 mm diameter wafers, wafers 200 mm diameter wafers, 300 mm diameter wafers, 450 mm diameter wafers, photolithography masks, photolithography reticles, semiconductor modules, semiconductor packages, circuit boards, magnetic disks, magnetic hard drive disks, magnetic floppy disks, laser disks, compact disks, digital video disks, optical disks, lenses and mirrors.

31. (Withdrawn) method of monitoring an internal environment of a product carrier or events affecting said product carrier in a manufacturing facility comprising a multiplicity of manufacturing tools, the method comprising:

providing a multiplicity product carriers having micro-sensors, each product carrier adapted to transport product undergoing manufacture between said manufacturing tools and each micro-sensor adapted to sense at least one attribute of an environment within each product carrier or an event affecting each product carrier and adapted to transmit date and time stamped product carrier identity and attribute and event data; and

providing one or more receiving stations, each receiving station for receiving said product carrier identity and attribute and event data from said micro-sensor.

32. (Withdrawn) The method of claim 31, further including providing a production control system for tracking the manufacturing tool location of said product carriers and for generating date and time stamped product carrier location data.

33. (Withdrawn) The method of claim 32, further including providing a product carrier monitoring system for collecting said date and time stamped product carrier identity and attribute and event data, cross-referencing said date and time stamped product carrier location data with said date and time stamped product carrier identity and attribute and event data and generating date and time stamped product carrier identity, attribute and event, and product carrier location data.

34. (Withdrawn) The method of claim 33, further including said product carrier monitoring system generating flags based on said attribute and event data.

35. (Withdrawn) The method of claim 34, further including providing a statistical process control system for generating an analysis of said attribute and event data.

36. (Withdrawn) The method of claim 35, further including transferring said statistical process control system said analysis of said attribute and event data to said production control system.

37. (Withdrawn) The method of claim 31, wherein said attribute of said environment within said product carrier or an event affecting the product carrier is selected from the group of attributes and events consisting of temperature, pressure, humidity, particulate count, the presence of oxygen, hydrogen, chlorine, elemental gases, ammonia, water vapor, hydrogen fluoride, hydrogen chloride, nitrogen oxides, silanes, alcohols, ketones, esters, amines, solvents, chlorinated solvents and fluoridated solvents, the occurrence of vibration, acceleration and shock, the intrusion of visible light, ultra-violet light, infrared light and microwaves, and electromagnetic events and static electric charge buildup.

38. (Withdrawn) The method of claim 31, wherein a product within said product carrier is selected from the group of products consisting of semiconductor substrates, 100 mm semiconductor substrates, 200 mm semiconductor substrates, 300 mm semiconductor substrates, 450 mm semiconductor substrates, wafers, 100 mm diameter wafers, 150 mm diameter wafers, wafers 200 mm diameter wafers, 300 mm diameter wafers, 450 mm diameter wafers,

photolithography masks, photolithography reticules, semiconductor modules, semiconductor packages, circuit boards, magnetic disks, magnetic hard drive disks, magnetic floppy disks, laser disks, compact disks, digital video disks, optical disks, lenses and mirrors.

39. (New) The apparatus of claim 10, wherein said gas or vapor is selected from the group consisting of oxygen, hydrogen, chlorine, other elemental gases, ammonia, water, hydrogen fluoride, hydrogen chloride, nitrogen oxides, silanes, alcohols, ketones, esters, amines, solvents, chlorinated solvents and fluoridated solvents.

40. (New) The apparatus of claim 2, wherein said first device and said second device are contained within said product carrier.

41. (New) The apparatus of claim 1, wherein said second device comprises a radio transceiver.

42. (New) The apparatus of claim 1, further including a wireless receiving station for receiving said data from said second device.

43. (New) The apparatus of claim 42, wherein said wireless receiving station is a radio receiver.

44. (New) The apparatus of claim 1, wherein said second device is adapted to transmit a date/time stamp with said data relating to said attribute.

45. (New) The apparatus of claim 1, wherein said second device is adapted to receive programming signals.
46. (New) The apparatus of claim 1, wherein said second device is adapted to receive control signals.
47. (New) The apparatus of claim 46, wherein said control signals are selected from the group consisting of on, off, reset, test and poll instructions.
48. (New) the apparatus of claim 1, further including a third device connected to said first and second devices, said third device including physical contacts to temporarily connect an external device to said first and second devices.
49. (New) The apparatus of claim 1, wherein one or both of said first and said second devices are self-powered.
50. (New) An apparatus, comprising:
- a product carrier adapted to transport product undergoing manufacture; and
 - a first device adapted to sense an event affecting said product within said product carrier;
- and
- a second device adapted to encode data relating to said event and to actively and wirelessly transmit said data.

51. (New) The apparatus of claim 50, wherein said event occurring to said product while within said product carrier comprises an electromagnetic, electrostatic or magnetic event.

52. (New) The apparatus of claim 51, wherein said electromagnetic, electrostatic or magnetic event includes the intrusion of visible light, ultra-violet light, infrared light, microwaves, into said product carrier and static electric charge build within said product carrier.

53. (New) The apparatus of claim 50, wherein said event occurring to said product while within said product carrier is selected from the group consisting of vibration, acceleration and shock up.

54. (New) The apparatus of claim 50, wherein said event excludes logistic and production control events.